

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

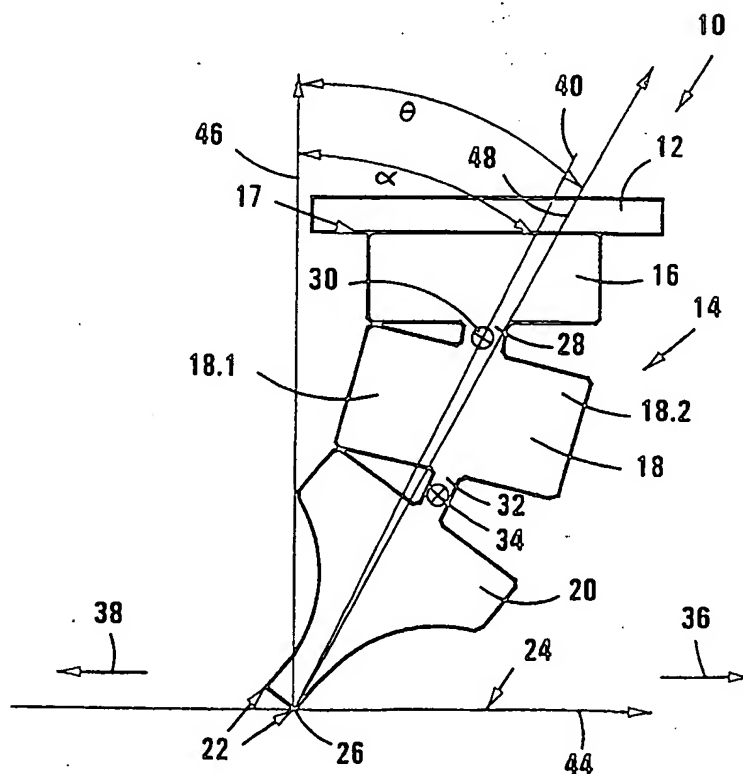
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(21) International Application Number: PCT/IB99/01305 (22) International Filing Date: 21 July 1999 (21.07.99) (30) Priority Data: 98/6583 23 July 1998 (23.07.98) ZA (71) Applicant (for all designated States except US): TRICO PRODUCTS CORPORATION [US/US]; 3255 West Hamlin Road, Rochester Hills, MI 48309 (US). (72) Inventor; and (75) Inventor/Applicant (for US only): SWANEPOEL, Adriaan, Retief [ZA/ZA]; 309 Aries Street, Waterkloof Ridge, 0181 Pretoria (ZA). (74) Agent: NACHENIUS, Elizabeth; Adams & Adams (Jhb Office), 3rd floor, 23 Wellington Road, Parktown, P.O. Box 10511, 2000 Johannesburg (ZA).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

x → 1, 2, 7, 13

(54) Title: WINDSCREEN WIPER BLADE

(57) Abstract

A windscreen wiper (10) includes an elongate beam (12) and a blade having a backing strip (16) which is attached to the beam (12), the backing strip (16) having a substantially planar upper surface (17) and a wiping portion (20) which has at least one wiping edge (22) which, in use, contacts a work surface to be wiped (24). The blade (14) further includes a plurality of hinges each defined by a suitably flexible web (28, 32) with a first hinge web (28) being adjacent the backing strip (16) and a second hinge web (32) being adjacent the wiping portion (20), with each hinge web (28, 32) having an axis (30, 34) and with each hinge web (28, 32) being able to flex between nominal limit positions on either side of its axis, whereby the wiping portion (20) is displaceable between nominal limit positions on either side of the backing strip (16), such that, at substantially any point along the length of the blade (14), if the blade is displaced to pivot the wiping portion (20) to one side, to its nominal limit position, the acute angle between a line between the edge (22), or the edge which would contact the work surface (24) with the blade (14) so displaced, and the axis of the first hinge web (28) and a line which extends substantially perpendicularly to the upper surface of the backing strip (16) is less than 33°.



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WINDSCREEN WIPER BLADE

This invention relates to a windscreen wiper, which is also
5 known as a windshield wiper. The invention also relates to a blade for
a windscreen wiper.

According to a first aspect of the invention, there is provided a
windscreen wiper, which includes

- 10 an elongate beam;
- a blade having
- a backing strip which is attached to the beam, the backing strip
having a substantially planar upper surface,
- a wiping portion which has at least one wiping edge which, in
15 use, contacts a work surface to be wiped,
- a plurality of hinges each defined by a suitably flexible web, with
a first hinge web being adjacent the backing strip and a second hinge
web being adjacent the wiping portion,
- with each hinge web having an axis and with each hinge web
20 being able to flex between nominal limit positions on either side of its
axis; whereby the wiping portion is displaceable between nominal limit
positions on either side of the backing strip,
- such that, at substantially any point along the length of the
blade, if the blade is displaced to pivot the wiping portion to one side,

25 to its nominal limit position, the acute angle between a line between
the edge, or the edge which would contact the work surface with the
blade so displaced, and the axis of the first hinge web and a line which
extends substantially perpendicularly to the upper surface of the
backing strip is
30 less than 33° .

The said acute angle may be less than 30° , and preferably
the angle is less than 27° .

35 The blade may have two discrete hinge webs. The axis
of each hinge web may be centrally located and may be a hinge axis.

The blade may have an intermediate portion which is
40 located between the backing strip and the wiping portion, with a first
hinge web being between the backing strip and the intermediate portion
and a second hinge web being between the intermediate portion and
the wiping portion.

45 The intermediate portion may have a pair of laterally
extending body parts, each having an upper surface, which faces the
backing strip, and a lower surface, which faces the wiping portion.

50 The upper and the lower surfaces of the intermediate portion may be substantially planar and may extend substantially parallel to the upper surface of the backing strip when the blade is in its unstressed form.

55 The backing strip may also have a pair of lower surfaces, on each side of the first hinge web, which face the intermediate portion and are spaced from the upper surfaces of the intermediate portion by the first hinge web. The lower surfaces of the backing strip may be planar and substantially parallel to the upper surface of the backing strip.

60 The wiping portion may extend on both sides from the second hinge web to have an upper surface on each side of the second hinge web, which face the intermediate portion. The upper surfaces of the wiping portion may also be planar and may also be substantially parallel to the upper surface of the backing strip when the blade is in its unstressed form.

70 It will be appreciated that the first hinge web will have a suitable width (the distance from the backing strip to the intermediate portion), the lower surfaces of the backing strip and the upper surfaces of the intermediate portion will have a suitable breadth (the distance from the first hinge web outwardly), to define the flexed nominal limit positions of the intermediate portion relative to the backing strip. It will

further be appreciated that the second hinge web will also have a suitable width, and the lower surfaces of the intermediate portion and the upper surfaces of the wiping portion will have a suitable breadth, to define the flexed nominal limit positions of the wiping portion relative to the intermediate portion.

The beam may have a varying width and thickness. The beam may be curved in a plane or may have compound curvature. In a preferred embodiment of the invention, an upper surface of the backing strip is secured to a bottom surface of the beam by means of an adhesive material.

It will further be appreciated that, in use, the friction force between the wiping portion of the rubber blade and the contact surface when the blade is displaced relative to the contact surface causes pivotal movement of the wiping portion. When the direction of displacement changes, it is desired that the blade pivots to the other side or "flips over". at the stage in its displacement relative to the contact surface in the instant before the rubber blade starts to "flip over".

In use, at the stage of the windscreen wiper's displacement relative to the contact surface, in the instant before the rubber blade starts to "flip over", when the blade is displaced by means

of a force which is substantially parallel to its upper surface;
with the force of friction vector $F(\mu)$ extending substantially parallel to
the upper surface of the backing strip from the edge which contacts
100 the working surface;
with the normal force vector representing the force being exerted by
the surface on the rubber blade, $F(v)$, extending substantially
perpendicularly to the upper surface of the backing strip; and
the resultant force vector $F(R)$ extending between $F(\mu)$ and $F(v)$,
105 the hinge axis of the first hinge web may be situated between the
vectors $F(v)$ and $F(R)$.

According to a second aspect of the invention, there is
provided a blade for a windscreen wiper, which includes

110 a backing strip which is attachable to the beam and which has
a substantially planar upper surface,

a wiping portion which has at least one wiping edge which, in
use, contacts a work surface to be wiped,

a plurality of hinges each defined by a suitably flexible web, with
115 a first hinge web being adjacent the backing strip and a second hinge
web being adjacent the wiping portion,

with each hinge web having an axis and with each hinge web
being able to flex between nominal limit positions on either side of its
axis, whereby the wiping portion is displaceable between nominal limit
120 positions on either side of the backing strip,

such that, at substantially any point along the length of the blade, if the blade is displaced to pivot the wiping portion to one side, to its nominal limit position, the acute angle between a line between the edge, or the edge which would contact the work surface with the blade so displaced, and the axis of the first hinge web and a line which extends substantially perpendicular to the upper surface of the backing strip is less than 33° .

The said acute angle may be less than 30° , preferably less than 27° .

The blade may have two discrete hinge webs. The blade may have an intermediate portion which is located between the backing strip and the wiping portion, with a first hinge web being between the backing strip and the intermediate portion and a second hinge web being between the intermediate portion and the wiping portion.

The intermediate portion may have a pair of laterally extending body parts, each having an upper surface, which faces the backing strip, and a lower surface, which faces the wiping portion. The upper and the lower surfaces of the intermediate portion may be substantially planar and may extend substantially parallel to the upper surface of the backing strip when the blade is in its unstressed form.

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In use, when the blade is displaced by means of a force which is substantially parallel to its upper surface;
with the force of friction vector $F(\mu)$ extending substantially parallel to
150 the upper surface of the backing strip from the edge which contacts the working surface;
with the normal force vector representing the force being exerted by the surface on the rubber blade, $F(v)$, extending substantially perpendicularly to the upper surface of the backing strip; and
155 the resultant force vector $F(R)$ extending between $F(\mu)$ and $F(v)$, the hinge axis of the first hinge web may be situated between the vectors $F(v)$ and $F(R)$.

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The blade may, conveniently, be of rubber which may be synthetic or natural, or any other suitable material or combination of materials. The blade may also be manufactured in an extrusion process, in one piece.

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The invention is now described, by way of example, with reference to the accompanying drawings.

In the drawings,

Figure 1 shows a three-dimensional view of one end of a blade

for windscreen wiper in accordance with the invention; and

170 Figure 2 shows an end view of the wiper of Figure 1, in use.

Referring to the drawings, a windscreen wiper in accordance with the invention, is generally designated by reference numeral 10. The wiper 10 includes an elongate beam 12 and a rubber blade generally indicated by reference numeral 14.

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The rubber blade 14 includes a backing strip 16 having a planar upper surface 17 which is attached to the beam 12 by means of an adhesive material. It also includes an intermediate portion 18 having a pair of laterally extending body parts 18.1 and 18.2. The rubber blade 14 further has a wiping portion 20 which tapers toward wiping edges 22 which, in use, contact a surface 24 to be wiped at a point of contact 26 (as shown in Figure 2). A first hinge web 28 having a centrally located first hinge axis 30 is defined between the backing strip 16 and the intermediate portion 18 of the rubber blade 14. The intermediate portion 18 is pivotal relative to the backing strip 16 about the first hinge axis 30, between a first nominal limit position on one side (as shown in Figure 2) where the body part 18.1 abuts the backing strip 16 and a second nominal limit position on the other side. The second limit position is not shown in Figure 2, but it will be appreciated that the second limit position will be where the body part 18.2 abuts the backing strip 16.

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A second hinge web 32 having a centrally located second hinge axis 34 is defined between the intermediate portion 18 and the wiping portion 20 of the rubber blade 14. The wiping portion 20 is in turn pivotal relative to the intermediate portion about the second hinge axis 34 between a first nominal limit position on one side (as shown in Figure 2) where the body part 18.1 and the wiping section 20 abut and a second nominal limit position on the other side. It will thus be appreciated that the wiping portion 20 will be pivotal relative to the backing strip 16 about nominal limit positions on either side.

As shown in Figure 2, if the blade 14 is displaced to pivot the intermediate portion 18 and the wiping portion 20 about the first and second hinge axes 30 and 34 respectively, to one side in the direction of the arrow 38, to their respective nominal limit positions, the line 40 between the point of contact 26 and the first hinge axis 30 will subtend an acute angle of about 30° with a line 46 that is perpendicular to the upper surface 17.

In use, the wiping portion 20 is displaced to one side by friction, the wiping portion 20 experiencing a friction force $F(\mu)$ which is dependent on the magnitude of the downward force exerted via the beam 12 and the coefficient of friction (μ). Thus, if the blade 14 is pressed downwardly onto the surface 24 so that contact is established between the wiping portion 20 and the surface 24 at the point of

contact 26, and displacement of the blade 14 relative to the surface is changed from a first direction as indicated by the arrow 36 to the opposite direction as indicated by the arrow 38, the point of contact will experience a typical normal force $F(v)$ represented by the vector 46 and a typical friction force $F(\mu)$ represented by the vector 44. The resultant force, $F(R)$, which is represented by vector 48 will subtend an angle Θ with respect to the normal force $F(v)$ which is then, typically, about 30° . The angle between the lines 40 and 46 is $26,5^\circ$, as indicated in Figure 2. The applicant has found that the coefficient of friction is usually greater than 0,6 although it can decrease to as low as 0,5. Thus, if the angle α between the lines 40 and 46 is less than, $26,5^\circ$ when the blade is deformed by the maximum expected down force, then it can be expected to always "flip over" in use.

CLAIMS:

1. A windscreen wiper, which includes

an elongate beam;

235 a blade having

a backing strip which is attached to the beam, the backing strip
having a substantially planar upper surface,

a wiping portion which has at least one wiping edge which, in
use, contacts a work surface to be wiped,

240 a plurality of hinges each defined by a suitably flexible web, with
a first hinge web being adjacent the backing strip and a second hinge
web being adjacent the wiping portion,

with each hinge web having an axis and with each hinge web
being able to flex between nominal limit positions on either side of its
245 axis, whereby the wiping portion is displaceable between nominal limit
positions on either side of the backing strip,

such that, at substantially any point along the length of the
blade, if the blade is displaced to pivot the wiping portion to one side,
to its nominal limit position, the acute angle between a line between
250 the edge, or the edge which would contact the work surface with the
blade so displaced, and the axis of the first hinge web and a line which
extends substantially perpendicularly to the upper surface of the
backing strip is
less than 33°.

255 2. The windscreen wiper as claimed in Claim 1, in which the
said acute angle is less than 30° .

3. The windscreen wiper as claimed in Claim 2, in which the
angle is less than 27° .

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4. The windscreen wiper as claimed in Claim 1, in which the
blade has two discrete hinge webs.

265 5. The windscreen wiper as claimed in Claim 4, in which the
blade has an intermediate portion which is located between the backing
strip and the wiping portion, with a first hinge web being between the
backing strip and the intermediate portion and a second hinge web
being between the intermediate portion and the wiping portion.

270 6. The windscreen wiper as claimed in Claim 5, in which the
intermediate portion has a pair of laterally extending body parts, each
having an upper surface, which faces the backing strip, and a lower
surface, which faces the wiping portion.

275 7. The windscreen wiper as claimed in Claim 6, in which the
upper and the lower surfaces of the intermediate portion are
substantially planar and extend substantially parallel to the upper
surface of the backing strip when the blade is in its unstressed form.

8. The windscreen wiper as claimed in Claim 1, in which the
280 beam has a varying width and thickness and is curved in a plane.

9. The windscreen wiper as claimed in Claim 8, in which an
upper surface of the backing strip is secured to a bottom surface of the
beam by means of an adhesive material.

10. The windscreen wiper as claimed in Claim 1, which, in
use, when the blade is displaced by means of a force which is
substantially parallel to its upper surface;

with the force of friction vector $F(\mu)$ extending substantially parallel to
290 the upper surface of the backing strip from the edge which contacts
the working surface;

with the normal force vector representing the force being exerted by
the surface on the rubber blade, $F(v)$, extending substantially
perpendicularly to the upper surface of the backing strip; and

295 the resultant force vector $F(R)$ extending between $F(\mu)$ and $F(v)$,
the hinge axis of the first hinge web is situated between the vectors
 $F(v)$ and $F(R)$.

11. A blade for a windscreen wiper, which includes

300 a backing strip which is attachable to the beam and which has
a substantially planar upper surface,

a wiping portion which has at least one wiping edge which, in

use, contacts a work surface to be wiped,

305 a plurality of hinges each defined by a suitably flexible web, with
a first hinge web being adjacent the backing strip and a second hinge
web being adjacent the wiping portion,

with each hinge web having an axis and with each hinge web
being able to flex between nominal limit positions on either side of its
axis, whereby the wiping portion is displaceable between nominal limit
310 positions on either side of the backing strip,

such that, at substantially any point along the length of the
blade, if the blade is displaced to pivot the wiping portion to one side,
to its nominal limit position, the acute angle between a line between
the edge, or the edge which would contact the work surface with the
315 blade so displaced, and the axis of the first hinge web and a line which
extends substantially perpendicular to the upper surface of the backing
strip is less than 33° .

12. The blade as claimed in Claim 11, in which the said acute
320 angle is less than 30° .

13. The blade as claimed in Claim 12, in which the angle is
less than 27° .

325 14. The blade as claimed in Claim 11, which has two discrete
hinge webs.

15. The blade as claimed in Claim 14, which has an intermediate portion which is located between the backing strip and the wiping portion, with a first hinge web being between the backing strip and the intermediate portion and a second hinge web being between the intermediate portion and the wiping portion.

16. The blade as claimed in Claim 15, in which the intermediate portion has a pair of laterally extending body parts, each having an upper surface, which faces the backing strip, and a lower surface, which faces the wiping portion.

17. The blade as claimed in Claim 16, in which the upper and the lower surfaces of the intermediate portion are substantially planar and extend substantially parallel to the upper surface of the backing strip when the blade is in its unstressed form.

18. The blade as claimed in Claim 11, which, in use, when it is displaced by means of a force which is substantially parallel to its upper surface;

with the force of friction vector $F(\mu)$ extending substantially parallel to the upper surface of the backing strip from the edge which contacts the working surface;

with the normal force vector representing the force being exerted by the surface on the rubber blade, $F(v)$, extending substantially

perpendicularly to the upper surface of the backing strip; and
the resultant force vector $F(R)$ extending between $F(\mu)$ and $F(v)$,
the hinge axis of the first hinge web is situated between the vectors
 $F(v)$ and $F(R)$.

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19. A windscreen wiper, substantially as herein described with
reference to the accompanying drawings.

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20. A blade for a windscreen wiper, substantially as herein
described with reference to the accompanying drawings.

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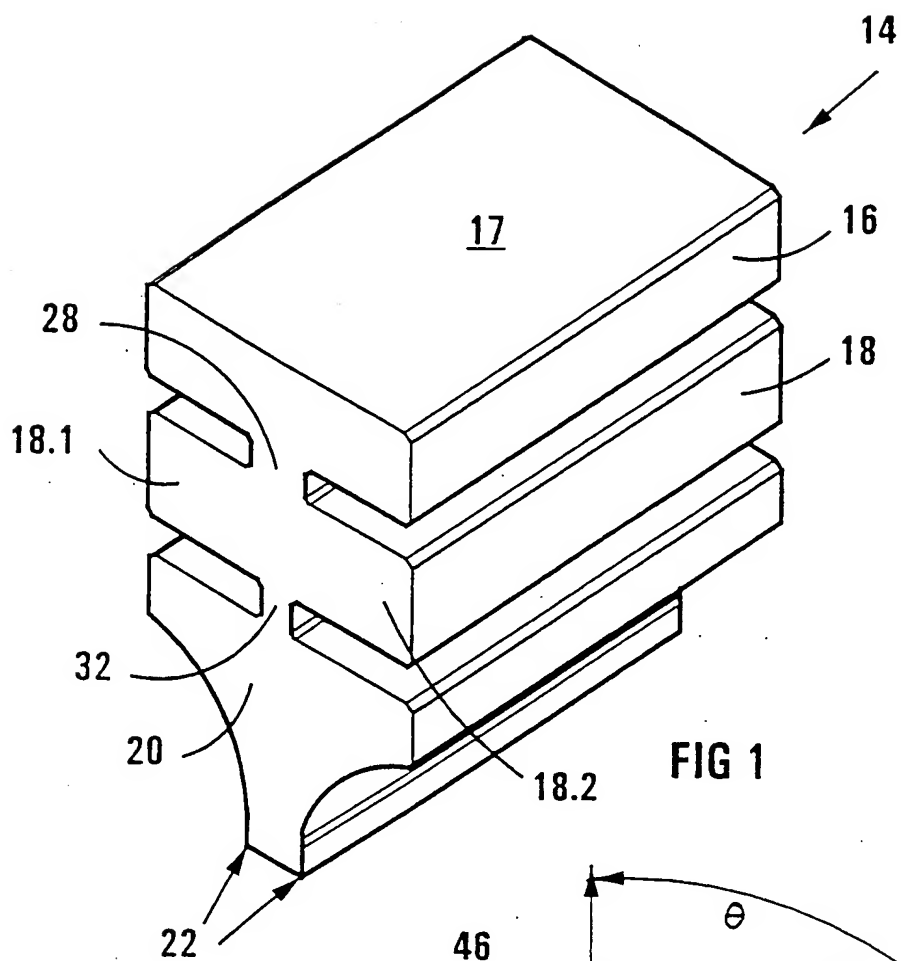
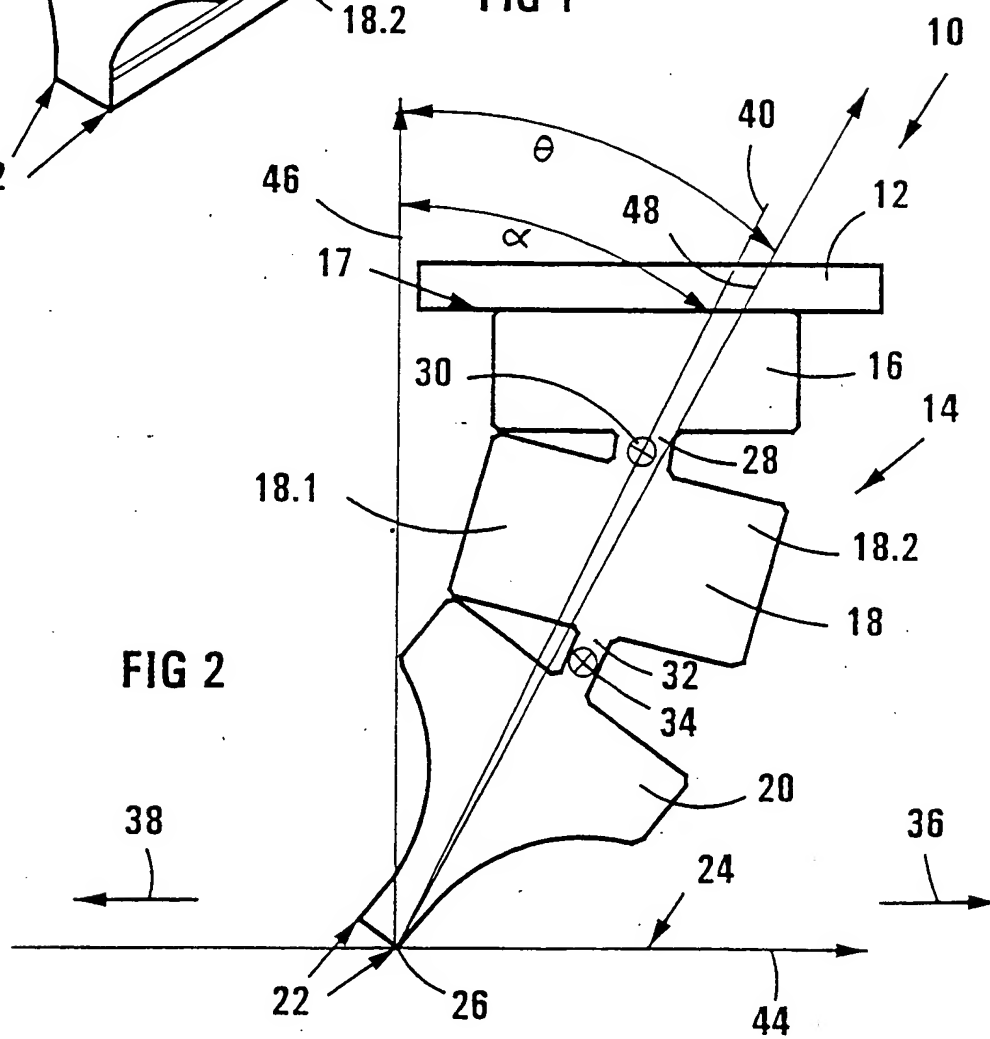


FIG 2



INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 99/01305

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B60S1/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B60S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	EP 0 744 326 A (VALEO SYSTEMES ESSUYAGE) 27 November 1996 (1996-11-27) column 3, line 18 - line 37	1,4-7, 11,14-17
A	FR 2 668 743 A (MERCEDES-BENZ AG) 7 May 1992 (1992-05-07) page 3, line 14 -page 4, line 14	1,4-7, 11,14-17
A	US 3 421 175 A (ROBERTS HARRY) 14 January 1969 (1969-01-14) column 2, line 35 - line 65	1,4-7, 11,14-17
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

25 October 1999

Date of mailing of the international search report

13/12/1999

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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